OPIC
Office de la propriété intellectuelle du Canada

CIPO
Canadian Intellectual Property Office

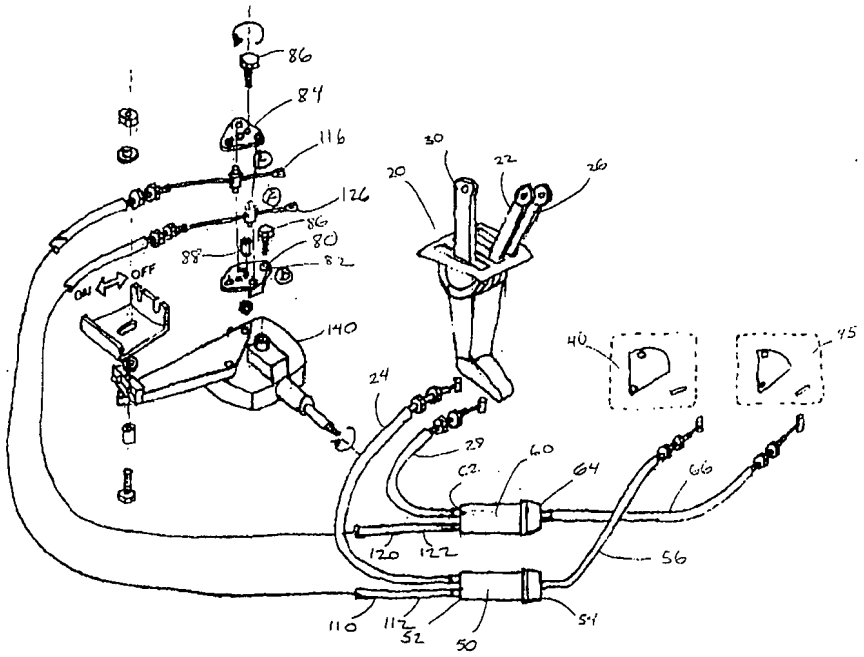
(12) (19) (CA) **Demande-Application**

(21) (A1) **2,207,938**
(22) 1997/06/16
(43) 1998/07/10

(72) RHEAULT, Alain, CA
(72) MICHEL, Camille, CA
(71) BOMBARDIER INC., CA

(51) Int.Cl.[6] B63H 21/21, B63H 11/103
(30) 1997/01/10 (08/782,490) US

(54) **SYSTEME DE DIRECTION A BASSE VITESSE**
(54) **LOW SPEED STEERING SYSTEM**



(57) La présente invention vise un système de direction à basse vitesse pour embarcation nautique dotée d'un moteur à réaction ou d'un autre type de moteur similaire, qui permet à l'utilisateur de manoeuvrer l'embarcation à faible vitesse. Le système comprend une série de câbles, des accouplements à glissement et un support de câbles. Au moment où la manette des gaz de l'embarcation est amenée à une position d'arrêt, le moteur se met à tourner au ralenti et la vitesse de ce dernier ainsi que la poussée de l'eau sortant du venturi et de la tuyère d'évacuation peuvent être régulées au moyen de la barre de gouvernail. Au fur et à mesure que la barre est tournée,

(57) The invention relates to a low speed steering system for a watercraft vehicle having a jet propulsion unit, or a similarly powered vehicle, which allows the operator of the vehicle to control maneuvering of the vehicle at low speeds. The low speed steering system is comprised of a plurality of cables, slide couplers, and a cable support. At such time as the vehicle throttle lever is set to an off position, the engine is calibrated so that it idles, and the engine speed and the thrust of the water exiting the venturi and exit nozzle may be controlled by the vehicle steering helm assembly. As the steering helm assembly is rotated, a set of cables extending from the cable

OPIC
OFFICE DE LA PROPRIÉTÉ INTELLECTUELLE DU CANADA

CIPO
CANADIAN INTELLECTUAL PROPERTY OFFICE

(21) (A1) **2,207,938**
(22) 1997/06/16
(43) 1998/07/10

un ensemble de câbles situés sur le support adjacent à cette dernière, actionnent le moteur. Lorsque le volant est orienté à un certain angle, dans le sens horaire ou antihoraire, par rapport à l'alignement de l'embarcation, un ensemble de câbles se prolongeant du support jusqu'aux accouplements à glissement actionnent le moteur. Au fur et à mesure que le volant est tourné dans le sens horaire ou antihoraire, la vitesse du moteur augmente jusqu'à environ 3000 tours à la minute et la poussée de l'eau, jusqu'à environ 50 livres. Le fait de pousser la barre de gouvernail dans le sens horaire génère suffisamment de puissance pour permettre à l'utilisateur d'accoster et de manoeuvrer l'embarcation avec précision en ligne droite. Selon une autre version, le système de direction peut comporter un ensemble de capteurs, d'interrupteurs et câbles électriques destinés à détecter la vitesse du moteur et la position de la barre de gouvernail. Le module électronique est conçu pour actionner le dispositif d'asservissement du carburateur et assurer la manoeuvre à basse vitesse de l'embarcation.

support adjacent to the steering helm assembly activates the vehicle engine. Upon rotation of the steering wheel a given degree in a clockwise or counter-clockwise direction from a straight alignment of the vehicle, a set of cables extending from the cable support to the slide couplers activates the vehicle engine. Rotation of the steering wheel a given degree in a clockwise or counter-clockwise direction increases engine speed from about 0 to about 3,000 revolutions per minute, and produces a thrust exiting the jet propulsion unit from about 0 to about 50 pounds. The rotation of the steering helm assembly a given degree in a clockwise direction produces a sufficient amount of power to enable the operator of the vehicle to manage docking and careful maneuvering of the watercraft vehicle in a rightward direction. In an alternative embodiment, the steering system may comprise a plurality of sensors, switches, and electrical wiring for detecting the engine speed and position of the steering helm assembly. The electronic apparatus function to activate the carburetor biasing means and provide low speed directional control of the watercraft vehicle.

ABSTRACT

The invention relates to a low speed steering system for a watercraft vehicle having a jet propulsion unit, or a similarly powered vehicle, which allows the operator of the vehicle to control maneuvering of the vehicle at low speeds. The low speed steering system is comprised of a plurality of cables, slide couplers, and a cable support. At such time as the vehicle throttle lever is set to an off position, the engine is calibrated so that it idles, and the engine speed and the thrust of the water exiting the venturi and exit nozzle may be controlled by the vehicle steering helm assembly. As the steering helm assembly is rotated, a set of cables extending from the cable support adjacent to the steering helm assembly activates the vehicle engine. Upon rotation of the steering wheel a given degree in a clockwise or counter-clockwise direction from a straight alignment of the vehicle, a set of cables extending from the cable support to the slide couplers activates the vehicle engine. Rotation of the steering wheel a given degree in a clockwise or counter-clockwise direction increases engine speed from about 0 to about 3,000 revolutions per minute, and produces a thrust exiting the jet propulsion unit from about 0 to about 50 pounds. The rotation of the steering helm assembly a given degree in a clockwise direction produces a sufficient amount of power to enable the operator of the vehicle to manage docking and careful maneuvering of the watercraft vehicle in a rightward direction. In an alternative embodiment, the steering system may comprise a plurality of sensors, switches, and electrical wiring for detecting the engine speed and position of the steering helm assembly. The electronic apparatus function to activate the carburetor biasing means and provide low speed directional control of the watercraft vehicle.

Low Speed Steering System

Background of the Invention

1. Field of the Invention

This invention relates to a low speed steering system for a watercraft vehicle powered by a jet propulsion unit. More particularly, this invention relates to a novel apparatus for controlling steering and movement of a watercraft vehicle at low speeds and a means for controlling the thrust of the water exiting the jet propulsion unit at corresponding low engine speeds.

2. Discussion of Related Art

Directional control of watercraft vehicles depend upon the thrust of the water exiting a jet propulsion unit. As the thrust of the water exiting the venturi and the exit nozzle of the jet propulsion unit decreases so does the engine speed of the watercraft vehicle. A conventional jet propulsion unit 210 for a watercraft is shown in Fig. 7 and is comprised of an inner housing and an outer housing. The outer housing comprises a water inlet portion 215 for allowing water into the propulsion unit. At low speed, the jet propulsion unit 210 creates a vacuum force at the intake through which the water travels. In a preferred embodiment, the water inlet portion is comprised of an intake grate like member, as shown at 215. The intake grate is attached to the outer housing by means of screws at a distal end of the outer housing, and

it allows for the free flow of water while protecting the jet propulsion unit 210 and its parts, such as an impeller 242, from pulling any harmful debris into the jet propulsion unit 210.

The outer housing further comprises a support 218 at a proximal end for receiving the impeller 242 , an impeller housing assembly 240, and a venturi 230. The support 218 comprises a circularly shaped aperture extending through the center of the support 218, and is adapted for receiving the impeller 242. In addition, the support 218 comprises a means for receiving the impeller housing assembly 240 and is secured thereto by means of fasteners and o-rings. The support 218 and the impeller housing assembly 240 are both adapted for receiving the impeller 242 and its associated wear-ring 246. The impeller 242 comprises a plurality of blades 248 and a wear-ring 246 which surrounds the impeller 242 as it spins. The impeller 242 spins inside very tight tolerances within the propulsion unit 210. The wear-ring 246 surrounds the impeller 242 such that if there is a problem the impeller 242 will damage an easy to replace item instead of the entire jet propulsion unit 210. The impeller 242 further comprises an impeller shaft 244 which is connected to the drive shaft of the engine through the impeller 242 The drive shaft of the engine causes the impeller 242 to rotate during use of the watercraft vehicle. At low speed, it is the rotation of the impeller 242 which creates a vacuum that pulls water into the inlet 215 of the jet propulsion unit 210. As the water approaches the rotating impeller 242, the blades 248 of the impeller 242 force the water toward a venturi 230 and a steering nozzle 228 at a stern end of the vehicle. It is the thrust created by the water mass accelerating in the venturi 230 which forces water through the jet propulsion unit 210 and moves the vehicle. The configuration of the jet propulsion unit 210 together with the impeller 242 allows the spinning impeller 242 to thrust water through the venturi 230.

The impeller 242 which is surrounded by a wear-ring 246 is further enclosed within an impeller housing 240 comprising a distal end 241 and a proximal end 249. The distal end 241 of the impeller housing 240 comprises a plurality of apertures for receiving attaching means and securing the impeller housing 240 to the support 218. The proximal end 249 of the impeller housing 240 has a plurality of apertures for securing the impeller housing 240 to a nozzle assembly 250. The impeller housing 240 further comprises stator vanes 224 formed integrally within the impeller housing 240. The spinning action of the impeller 242 causes the water to leave the impeller housing 240 in a swirling torrent of inefficient force. The stator vanes 224 located aft of the impeller 242 function to align the water as it moves away from the impeller housing 240. Attached to a proximal end of the impeller housing 249 is a thrust cone 226 for directing the water to the nozzle assembly 250. The thrust cone 226 controls the acceleration of the water as it exits the stator vanes 224 during its acceleration through the nozzle assembly 250.

The nozzle assembly 250 is attached to the secondary housing by means of screws. The steering nozzle 228 works to push the exiting water rearward in a controlled stream of propulsion. As shown in Fig. 1, the venturi 230 is distal of the steering nozzle 228 and functions to control the thrust and velocity of the water flow exiting the impeller housing 240. Accordingly, the water exiting the venturi 230 enters the steering nozzle 228 which redirects the water exiting the jet propulsion unit 210, allowing for controlled maneuvering of the watercraft vehicle.

Typically, the directional control and movement of the watercraft vehicle at low speeds has been through activating the engine throttle to increase engine speed and create an increased thrust from the water exiting the jet propulsion unit. In general, the throttle controls

the thrust of the water passing through and exiting the jet propulsion unit by regulating engine speed, thereby controlling the speed of the vehicle and allowing the operator to move a steering helm wheel, or a similar means, to control the directional movement of the vehicle. Accordingly, it has become common practice in the art for an operator to manually utilize the throttle together with the steering helm wheel in order to regulate the direction and velocity of water exiting the jet propulsion unit, thereby controlling the watercraft vehicle's direction for travel.

Several steering control apparatus for watercraft vehicles have been patented. The steering control apparatus disclosed in the Prior Art comprise means for controlling the direction of the fluids exiting the nozzles, thereby controlling the direction of travel of the vehicle. However, none of the patents disclose a means for controlling movement of the watercraft vehicle at low speeds by means of activating and controlling the carburetor and the air-fuel mixture being supplied to the carburetor. Furthermore, the Prior Art fails to disclose means for controlling the thrust and directional control of the vehicle at low speeds through the exclusive use of the steering helm assembly.

Therefore, what is desirable is a novel low speed steering apparatus for a jet propulsion unit for a watercraft vehicle having a means for controlling the air-fuel mixture of the carburetor and corresponding internal combustion engine, wherein the thrust of the water exiting the venturi and corresponding exit nozzle may be alternatively controlled by the steering helm assembly or a series of electronic sensors and switches. The apparatus is variable among several different positions so that the steering helm assembly or an electronic control means may each be alternatively activated to control the thrust as well as directional movement of the vehicle during alternative riding conditions at low speeds.

SUMMARY OF THE INVENTION

It is therefore the general object of the present invention to provide a low speed steering system for a watercraft vehicle for controlling and enhancing the directional movement of a watercraft vehicle at such speeds.

It is a further object of the invention to provide a plurality of cables within the low speed steering system for controlling the thrust of the jet propulsion unit by means of the steering helm assembly. By placing the throttle control in an off position, the operator may control the thrust of the water exiting the jet propulsion unit exclusively by means of the steering helm.

It is an even further object of the invention to provide an electronic control means within the steering system for applying a minimal thrust to the jet propulsion unit. At such time as the throttle is set to an off position, the electronic control means may provide a minimal thrust to the jet propulsion unit for enhancing docking and other directional movements of the watercraft vehicle.

Furthermore, it is a further object of the invention to provide a biasing means for controlling the air-fuel mixture flowing into the carburetor of the watercraft vehicle. A plurality of cables or electronic sensors and switches are connected to a carburetor biasing means for alternatively controlling the air-fuel mixture flow into the carburetor.

Another object of the invention is to control the thrust of the engine and the directional control of the vehicle by means of rotating the steering helm assembly in a given clockwise or counter-clockwise direction. By setting the throttle to an off position, the directional control of the vehicle together with the thrust of the water exiting the jet propulsion

unit may be controlled by means of the steering helm assembly.

It is an even further object of the invention, to provide a plurality of cables, a cable support and a slide coupler means connecting the throttle and the steering helm assembly to a biasing means for the carburetor. The slider coupler means, together with the cable support, function to control the carburetor actuator means and to allow either the throttle or the steering helm assembly to control the thrust of the water exiting the jet propulsion unit.

In accordance with the invention, these and other objectives are achieved by providing a low speed steering system comprising a novel means for controlling the thrust of the water exiting the jet propulsion unit for enhancing docking and other directional control movements of a watercraft vehicle. Accordingly, the novel low speed steering system configuration enables an operator of the vehicle to directionally control steering of the watercraft vehicle by means of the steering helm assembly when the throttle is set in an off position.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects, features and advantages of the invention, as well as the invention itself, will become better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a schematic illustration of a conventional steering system of a watercraft vehicle including the low speed steering system in accordance with the present invention.

FIG. 2 is a schematic illustration of a novel low speed steering system of a

watercraft vehicle of the present invention.

FIG. 3 is an exploded view of a conventional steering system for a watercraft vehicle.

FIG. 4 is a schematic illustration of a conventional steering helm.

FIG. 5 is an exploded view of the novel steering system of a watercraft vehicle of the present invention.

FIG. 6 is a side elevational view of a cable support of the novel low speed steering system of a watercraft vehicle of the present invention.

FIG. 7 is a schematic illustration of a conventional jet propulsion unit of a watercraft vehicle.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS AND BEST MODE OF THE INVENTION

Although the disclosed invention may have broad applicability, it relates primarily to an apparatus for controlling steering of a watercraft vehicle at low speeds and more specifically to a personal watercraft vehicle or similarly powered watercraft vehicle. This invention is applicable to all watercraft vehicles propelled by means of a jet propulsion unit, including those configured with an impeller as well as those configured with an outboard motor. The following description will indicate certain items as occurring in pairs when either one or both items are shown in the accompanying drawings. It is to be understood that the portion of each pair which is not shown is identical to the illustrated part and performs the same function as

the illustrated item. Accordingly, it should be noted that like reference numerals are used throughout the attached drawings to designate the same or similar elements or components.

In a conventional watercraft vehicle, it is difficult to control directional movement of the vehicle at low speeds at such time as an operator is maneuvering the watercraft vehicle at low speeds, such as in a docking procedure or a specially controlled positioning procedure. In general, greater thrust of the water exiting the jet propulsion unit improves the steering and directional control available to the operator of the vehicle. Accordingly, the novel arrangement of the low speed steering system provides improved directional control of a watercraft vehicle when it is operating at low engine speeds with a decreased thrust as well as enhanced direction control at such time as the watercraft vehicle operates at higher engine speeds and an increased thrust.

Referring now to the drawings, Fig. 1 illustrates a schematic illustration of a twin engine arrangement for a watercraft vehicle having a conventional steering system. Although this illustration is of a twin engine arrangement, the steering system is equally applicable to a watercraft vehicle having a single engine arrangement. Furthermore, this invention is applicable to all types of watercraft vehicles, including personal watercraft vehicles and similarly powered watercraft vehicles. In a twin engine arrangement, the throttle assembly 20 is comprised of three levers 22, 26 and 30. The first and second levers 22 and 30, are for independently controlling performance of the two engines of the vehicle and the thrust of the water exiting the jet propulsion unit of the corresponding engine. A third lever 26 is for controlling forward, reverse and neutral movement of the vehicle. Activation of each engine may be controlled independently by adjustment of the first and second throttle levers 22 and 30 independently. By separately

adjusting and controlling the first and second throttle levers 22 and 30, the operator of the vehicle can separately control performance of each of the engines and manipulate the performance and directional control of the vehicle. Some vehicles which comprise a twin engine arrangement may comprise separate throttle levers for each of the engines, but only a single steering cable for the corresponding exit nozzles. In this specific configuration, the corresponding exit nozzles are coupled together. Furthermore, in a vehicle which comprises a single engine arrangement, there are two throttle levers, one lever for controlling forward, reverse and neutral movement of the vehicle and a second lever for controlling performance of the engine.

The throttle assembly 20 comprises a plurality of cables extending from a distal end of the assembly. In a conventional twin engine steering system, a first set of cables 24 and a second set of cables 28 extend from the distal end of the first and second throttle levers 22 and 30 to the carburetors of each of the engines (not shown). The first set of cables 24 extend from the first throttle lever 22 to the left engine and the second set of cables 28 extend from the second throttle lever 30 to the right engine. More specifically, the first and second sets of cables, 24 and 28, each attach to a biasing means 40 and 45 of each of the respective carburetors for controlling the air-fuel mixture in each of the carburetors by means of slide couplers 50 and 60. A third set of cables 32 extend from a distal end of the third throttle lever 26 to an exit nozzle of the jet propulsion unit (not shown) and controls the directional displacement of the water exiting the nozzle and the movement of the watercraft vehicle.

In the novel steering system of the present invention, as illustrated in Fig. 2, the throttle assembly comprises a first set of cables 24 and a second set of cables 28. The first set of cables 24 extend from the first throttle lever 22 to a carburetor biasing means 40 of the left

engine by means of a left slide coupler 50. The second set of cables 28 extend from the second throttle lever 26 to a carburetor biasing means 45 of the right engine by means of a right slide coupler 60. The first set of cables 24 extend from the first throttle lever 22 to a proximal end 52 of the left slide coupler 50. The second set of cables 28 extend from the second throttle lever 30 to a proximal end 62 of the right slide coupler 60. Both the first set of cables 24 and the second set of cables 28 attach to the respective slide couplers 50 and 60 at a proximal end. Accordingly, the first throttle lever 22 controls the engine on the left side of the vehicle and the second throttle lever 30 controls the engine on the right side of the vehicle.

Both the left slide coupler 50 and the right slide coupler 60 each comprise a proximal end 52 and 62 and a distal end 54 and 64, respectively. The proximal ends 52 and 62 of the slide couplers 50 and 60 are adapted to receive the first and second cables 24 and 28 extending from the first and second throttle levers 22 and 30. The distal end 54 and 64 of the slide couplers 50 and 60 comprise an additional set of cables extending therefrom. The first cable 56 extends from the distal end 54 of the left slide coupler 50 to the biasing means of the left carburetor 40, and the second cable 66 extends from the distal end 64 of the right slide coupler 60 to the biasing means of the right carburetor 45. The proximal end of the slide couplers 50 and 60 are further adapted to receive an additional set of cables 110 and 120 extending from the steering helm assembly 140 . Accordingly, the proximal end of the slide couplers 50 and 60 are adapted to receive a plurality of cables from both the steering helm assembly 140 and the throttle assembly 20 and to control the connection of each set of cables to the left and right engines of the watercraft vehicle.

Fig. 3 is illustrative of an external portion of a conventional steering helm

assembly 140 for a watercraft vehicle, including the steering wheel 142 and the steering helm 143. The steering helm assembly 140 controls steering of the watercraft vehicle by means of a steering cable 144 which extends from the steering wheel 142 to an exit nozzle adjacent to the jet propulsion unit of the watercraft vehicle. Fig. 4 is a schematic of the steering assembly of the present invention. As shown in Fig. 4, the steering cable 144 extends from a distal portion of the steering helm assembly to the hull portion of the watercraft vehicle. The steering cable 144 further extends from a rear portion of the hull 156 to a pivot connection 158 adjacent the exit nozzle of the jet propulsion unit. The conventional steering helm assembly 140 further comprises a support cable 146 having a distal end 148 extending from an underside portion of the steering helm assembly toward the steering cable 144. The support cable 146 is configured to support the steering cable 144 adjacent to a distal end 148 of the steering helm assembly 140. A proximal end 150 of the steering helm assembly 140 has the steering cable 144 extending therefrom and through the steering column. The steering helm 140 further comprises a collar 152 surrounding the steering cable 144 adjacent to the proximal end of the steering helm assembly 140. The collar 152 extends from the proximal end of the steering helm assembly 150 to a central portion of the steering wheel 142, which has an aperture through its central portion for receiving the collar 152 and the steering cable 144. The front surface of the steering wheel 142 comprises a center steering portion 154 for receiving the steering cable 144 and enclosing the aperture extending through the steering wheel 142 . Accordingly, a conventional steering helm assembly comprises a steering cable 144 extending from the steering wheel to the exit nozzle of the jet propulsion unit so that rotation of the steering wheel allows the operator to control the directional movement of the exit nozzle.

The novel steering system comprises a cable support 100 which is attached to and made a part of the steering helm assembly 140 adjacent to the distal end of the steering helm assembly 148, as illustrated in Figs. 5 and 6. The cable support 100 comprises a support 130 having an aperture 135 for securing the cable support 100 to the steering cable 144 adjacent to a proximal end of the support cable 146. In a twin engine configuration, the novel steering system comprises a first cable 110 and a second cable 120 extending from each of the left and right slide couplers 50 and 60 to the cable support 100. The first cable 110 comprises a proximal end 112 which is attached to the left slide coupler 50 and is mounted to a first slot 102 of the cable support. Similarly, the second cable 120 comprises a proximal end 122 which is attached to the right slide coupler 60 and is mounted to a third slot 104 of the cable support 100. In a single engine configuration, there is only a single cable extending from a single slide coupler to the cable support 100 and the single cable is mounted in the center slot 106 of the cable support 100.

The novel steering helm assembly 140 further comprises a clamp 80 mounted on and connected to a top surface area of the steering helm assembly 140, as shown in Figs. 2 and 5. The clamp 80 comprises an aperture 82 at a distal end for receiving a screw for securing the clamp 80 to the steering helm assembly 140. The clamp further comprises a plurality of apertures adjacent to a proximal end of the clamp. These apertures are adapted for receiving and containing the distal end 114 of the first cable 110 and the distal end 124 of the second cable 120. In a single engine arrangement, the clamp 80 is adapted to receive a single cable in the central slot of the clamp 80. As illustrated in Figs. 2 and 5, the distal ends of the first and second cables 110 and 120 each comprise a stopper 116 and 126, respectively. The stoppers 116 and 126 are permanently affixed to the distal end of each of the first and second cables 110 and 120 and are

received by the clamp 80. Accordingly, the distal ends of the first and second cables 114 and 124 are attached to the clamp 80 and held in place by means of the stoppers 116 and 126.

The clamp 80 further comprises an upper clip 84 fitting over a top surface of the clamp 80. The upper clip 84 comprises a plurality of apertures for receiving screws 86 and securing the upper clip 84 to the clamp 80. In a further embodiment, the novel steering helm assembly 140 further comprises a spacer 88 disposed between the clamp 80 and the upper clip 84, to provide space (a gap) therebetween for receiving a plurality of cylinders (not shown) adjacent to the distal ends 114 and 124 of the first and second cables 110 and 120. Each of the cylinders receive the stoppers 116 and 126 at the distal end of each of the cables 110 and 120. In a single engine arrangement, the steering helm assembly comprises a single cylinder for receiving a stopper at a distal end of a single cable. Both the clamp 80, the upper clip 84, and the cylinders are rotatable and allow the first and second cables 110 and 120 to rotate with the rotational movement of the steering wheel 142. As the steering wheel 142 is rotated, the steering cable 144 is rotated and controls the directional movement of the exit nozzle and the watercraft vehicle. In addition, the cylinders are adapted to push or pull the cables 110 and 120 by means of the corresponding stoppers 116 and 126, depending upon the directional rotation of the steering wheel 142. When the watercraft vehicle is at rest, the stoppers 116 and 126 of each of the respective cables 110 and 120 are located in a midsection of each of the respective cylinders. Accordingly, as the steering wheel 142 is rotated in a clockwise or counterclockwise direction, the cylinders rotate together with the clamp 80 and the upper clip 84.

At such time as the vehicle is in a rest position and the throttle levers 22 and 30 are in an off position, the steering wheel 142 may be rotated in a given clockwise position in

order to activate the low speed steering system. When the throttle levers are set in an off position, the engine is calibrated to idle. The engine may be shut off only by activation of a separate switch. The rotation of the steering wheel from a rest position to a given position causes the cylinder holding the stopper 126 of the second cable 120 attached to the right slide coupler 60 to be pulled, and the cylinder holding the stopper 116 of the first cable 110 attached to the left slide coupler 50 to be pushed. This action of the steering wheel 142 causes the activation of the carburetor biasing means 45 of the right engine. Similarly, at such time as the vehicle is in a rest position and the throttle levers 22 and 30 are in an off position, the steering wheel 142 may be rotated a given degree in a counter-clockwise direction. The rotation of the steering wheel from a rest position to a given position causes the cylinder holding the stopper 116 of the first cable 110 to be pulled, and the cylinder holding the stopper 126 of the second cable 120 attached to the right slide coupler 60 to be pushed. This rotation of the steering wheel 142 further causes activation of the biasing means 40 attached to the left engine by means of the cable support 100 and the left slide coupler 50. Depending upon calibration of the novel steering assembly, rotation of the steering wheel in a clockwise or counter-clockwise direction for activation of the low speed steering system may be approximately 180°. At such time as the steering wheel 142 is returned to a straight maneuvering position from a given clockwise or counter-clockwise rotation, the respective carburetor biasing means 40 and 45 cause the first and second cables 110 and 120 to return to their rest positions. Accordingly, at such time as the vehicle is in a rest position and the steering wheel is rotated a given degree in a clockwise or counter-clockwise direction, the cylinder holding the distal ends of the cables will control the pulling and activation of the carburetor biasing means of either the left or right engine, thereby controlling rotation of

the vehicle engine as well as the thrust and directional movement of the watercraft vehicle.

The left and right slide couplers 50 and 60 control activation of the left and right side engines of the vehicle depending upon activation of the throttle assembly 20 or the steering helm assembly 140. The slide couplers 50 and 60 control the movement received from the throttle levers 22 and 30 as well as movement received from rotation of the steering wheel 142. The proximal ends 52 and 62 of the slide couplers 50 and 60 are adapted to receive both the first and second sets of cables 24 and 28 from the first and second throttle levers 22 and 30 as well as the first and second sets of cables 110 and 120 from the cable support 100 and the steering helm assembly 140. However, the distal ends of the slide couplers comprise only one cable extending from each of the slide couplers. A first cable 56 extends from the left slide coupler 50 to the left engine carburetor biasing means 40, and a second cable 66 extends from the right slide coupler 60 to the right engine carburetor biasing means 45. Both the first cable 56 and the second cable 66 independently control actuation of the biasing means of the carburetors of the respective engines.

Upon activation of either the first throttle lever 22 or the second throttle lever 30, the respective cable extending to the slide coupler actuates the cable extending to the biasing means of the respective carburetor. The same action causes the activated slide couplers to tighten control on the activated cables and to provide an increased backlash (slack) in the cable extending from the slide coupler to the steering assembly 140. The increased backlash in the cables 110 and 120 extending from the slide coupler to the steering helm assembly 140 allows directional control of the vehicle by the steering helm assembly 140 through the steering cable 144 without adjustment to the biasing means of the carburetor. Accordingly, this arrangement

allows standard directional control of a watercraft vehicle by means of the steering helm assembly 140 at such time as the throttle lever is activated to control the thrust of the water exiting the jet propulsion unit.

In an alternative configuration, when the throttle is set to an off position, both steering and thrust may be activated by the steering helm assembly 140. Depending upon which direction the operator needs to move the vehicle, the operator may rotate the steering wheel 142 a given degree in either a clockwise or counter-clockwise direction. It is important to note that a clockwise or counter-clockwise rotation of a steering wheel of a watercraft vehicle by a given degree of rotation from a straight alignment of the vehicle may activate the low speed steering system, but the degree of rotation needed for activation may differ according to the calibration of the steering assembly. Rotation of the steering wheel 142 in a clockwise direction causes rotation of the left cylinder which pulls on the first cable 110 attached to the proximal end of the left slide coupler 52. This rotation of the steering wheel 142 further causes a backlash in the cable extending from the left slide coupler 50 to the first throttle lever 22. Furthermore, the clockwise rotational movement allows the first cable 110 to actuate the first cable 56 extending from the distal end of the left slide coupler 54 to the biasing means of the carburetor of the left engine 40. Similarly, rotation of the steering wheel 142 in a counter-clockwise direction causes rotation of the right cylinder which pulls on the second cable 120 attached to the proximal end of the right slide coupler 60. This rotation of the steering wheel 142 further causes a backlash in the second cable 28 extending from the right slide coupler 60 to the second throttle lever 30 and allows the second cable 120 to actuate the second cable 66 extending from the distal end of the right slide coupler 64 to the carburetor biasing means of the right engine 45.

At such time as the first and second throttle levers 22 and 30 are set to an off position, rotation of the steering wheel 142 actuates the left or right engine and controls the thrust of the water exiting the jet propulsion unit and speed of the engine. The degree of rotation of the steering wheel 142 together with the backlash in the cables extending from the first and second throttle levers 22 and 30 to the left and right slide couplers 50 and 60 will determine adjustment of the engine speed and the thrust of the water exiting the jet propulsion unit. Control of the watercraft vehicle by means of the steering helm wheel 142 may produce from about 0 to about 50 pounds of thrust exiting the jet propulsion unit and an engine speed from about 0 to about 3,000 revolutions per minute. However, the engine speed and thrust generated by rotation of the steering wheel may be calibrated as required. At such time as the steering helm wheel 142 is rotated a given degree in a clockwise or counter-clockwise direction from a neutral position, the amount of thrust produced together with the engine speed is sufficient to enable control of directional movement of the vehicle by the operator through movement of the steering wheel 142. The minimal thrust produced by rotation of the steering wheel 142 assists the operator in docking procedures as well as other low speed maneuvers. The necessary degree of rotation of the steering wheel from a neutral position may be approximately 180° to generate a maximum thrust and speed. However, the degree of rotation may be separately calibrated for different vehicles. Accordingly, the directional rotation of the steering helm wheel 142 produces sufficient thrust to enable controlled steering of the watercraft vehicle as well as provide an improved directional control of the vehicle, which may be separately calibrated for different vehicles.

In an alternative embodiment, the low speed steering system may be comprised of

a series of electronic controls and wires. This further embodiment comprises a steering helm assembly having sensors or switches for detecting the degree of rotation of the steering wheel. In addition, the carburetor biasing means comprises a separate set of switches for controlling the air-fuel mixture entering each of the respective carburetors. At such time as the throttle levers 22 and 30 are set to an off position and the engine continues to idle, the steering wheel may be rotated to a given degree in a clockwise or counter-clockwise direction. When the steering wheel is rotated in a clockwise direction a first set of sensors or switches adjacent to the steering wheel activate the carburetor biasing means of the right carburetor. Similarly, as the steering wheel is rotated in a counter-clockwise direction the first set of sensors or switches adjacent to the steering wheel activate the carburetor biasing means of the left carburetor. In a preferred embodiment, the biasing means of the right carburetor is a solenoid switch. The switches and sensors adjacent to the steering wheel are connected to the solenoid switches adjacent to the corresponding right and left carburetors by means of electronic wires. This preferred embodiment sends an electric current through the wires from the steering assembly to the carburetor biasing means, thereby activating the air-fuel mixture in each of the respective carburetors and controlling the engine speed and thrust of the water exiting the jet propulsion unit. Accordingly, as such time as the steering wheel 142 is returned to a neutral maneuvering position from either a given clockwise or counter-clockwise rotation, the sensors and switches adjacent to the steering assembly cause the carburetor biasing means of the respective right and left carburetors to adjust the air-fuel mixture in each of the respective carburetors so that the watercraft vehicle engine returns to a neutral idling position.

The above description is of a novel low speed steering system for controlling the

thrust of the water exiting the jet propulsion unit while providing directional control of movement of a watercraft vehicle at low speeds. Although the present invention has been described in connection with preferred embodiments thereof, it will be appreciated by those skilled in the art that additions, deletions, modifications, and substitutions not specifically described may be made without departing from the spirit and scope of the invention as defined in the appended claims and the scope should not be limited to the dimensions indicated hereinabove.

What is Claimed:

1. A low speed steering apparatus for a watercraft vehicle, comprising:

a steering helm assembly;

a plurality of cables for controlling vehicle performance;

a carburetor biasing means for controlling air-fuel mixture flowing into the carburetor; and

a means for controlling movement of said cables.

2. The low speed steering apparatus of claim 1, wherein said cable positioning means being a slide coupler.

3. The low speed steering apparatus of claim 2, further comprising:

a first cable extending from said carburetor biasing means to a distal end of said slide coupler;

a second cable extending from a proximal end of said slide coupler to a throttle lever; and

a third set of cables extending from the proximal end of said slide coupler to the steering helm assembly.

4. The low speed steering apparatus of claim 3, wherein directional movement of said

vehicle and engine performance being controlled by the steering helm assembly upon setting said throttle lever in an off position.

5. The low speed steering apparatus of claim 4, further comprising a cable support adjacent to said steering helm assembly for receiving said third set of cables.

6. The low speed steering apparatus of claim 5, wherein said cable support further comprising a plurality of cylinders for receiving a distal end of said third set of cables, and controlling movement of said third set of cables upon rotational movement of the steering helm assembly.

7. The low speed steering apparatus of claim 6, wherein rotating said steering helm assembly causes activation of the carburetor biasing means and rotation of said vehicle engine.

8. The low speed steering apparatus of claim 6, wherein rotation of said steering helm assembly being in a clockwise direction.

9. The low speed steering apparatus of claim 6, wherein rotation of said steering helm assembly being in a counter-clockwise direction.

10. The low speed steering apparatus of claim 7, wherein engine speed being from about 0 to about 3,000 revolutions per minute.

11. The low speed steering apparatus of claim 6, wherein said watercraft vehicle comprising a jet propulsion unit for powering said vehicle.

12. The low speed steering apparatus of claim 11, wherein rotation of said steering helm assembly causes activation of the carburetor biasing means and an increase in thrust of water exiting the vehicle's jet propulsion unit.

13. The low speed steering apparatus of claim 12, wherein the thrust of water exiting the jet propulsion unit being from about 0 to about 50 pounds.

14. The low speed steering apparatus of claim 8, wherein rotation of said steering helm assembly moves said vehicle in a direction toward the right.

15. The low speed steering apparatus of claim 9, wherein rotation of said steering helm assembly moves said vehicle in a direction toward the left.

16. The low speed steering apparatus of claim 7, wherein activation of the carburetor biasing means by said steering helm assembly causing an accumulated backlash in said second cable.

17. The low speed steering apparatus of claim 3, wherein activation of said throttle lever causing an accumulated backlash in said third set of cables.

18. The low speed steering apparatus of claim 16, wherein the backlash in said third set of cables allowing steering control of said vehicle by means of said steering helm assembly, and engine control by means of said throttle lever.

19. The low speed steering apparatus of claim 16, wherein the backlash in said second cable allowing steering control of said vehicle by means of said steering helm assembly, and engine control by means of said steering helm assembly.

20. A low speed steering apparatus for a watercraft vehicle, comprising:

a steering helm assembly;

a plurality of cables for controlling vehicle performance;

a carburetor biasing means for controlling air-fuel mixture flowing into said carburetor; and

a means for controlling positioning and orientation of said cables.

21. The low speed steering apparatus of claim 20, wherein cable positioning and orientation means being a cable support.

22. The low speed steering apparatus of claim 21, further comprising:

a first cable extending from said carburetor biasing means to a distal end of said slide coupler;

a second cable extending from a proximal end of said slide coupler to a throttle

lever; and

a third set of cables extending from the proximal end of said slide coupler to the steering helm assembly.

23. The low speed steering apparatus of claim 22, wherein the cable support further comprising a plurality of apertures for receiving said third set of cables and controlling actuation of said carburetor biasing means upon setting said throttle lever in an off position.

24. The low speed steering apparatus of claim 23, wherein the cable support further comprising a plurality of cylinders for receiving a distal end of said third set of cables.

25. The low speed steering apparatus of claim 24, wherein said cylinders pull said third set of cables upon rotational movement of the steering helm assembly.

26. The low speed steering apparatus of claim 25, wherein rotational movement of said steering helm assembly causing an engine speed from about 0 to about 3,000 revolutions per minute.

27. The low speed steering apparatus of claim 25, wherein said watercraft vehicle comprising a jet propulsion unit for powering said vehicle.

28. The low speed steering apparatus of claim 27, wherein rotational movement of said

steering helm assembly causing a thrust of water exiting the jet propulsion unit being from about 0 to about 50 pounds.

29. A low speed steering system for a watercraft vehicle having a jet propulsion unit, comprising:

a steering helm assembly;

a plurality of cables for controlling vehicle performance;

a carburetor biasing means for controlling air-fuel mixture flowing into the carburetor;

a means for controlling movement of said cables;

a means for controlling positioning and orientation of said cables.

28. The low speed steering system of claim 27, wherein cable pulling means being a slide coupler.

29. The low speed steering system of claim 28, wherein cable positioning means being a cable support.

30. The low speed steering system of claim 29, further comprising:

a first cable extending from said carburetor biasing means to a distal end of said slide coupler;

a second cable extending from a proximal end of said slide coupler to a throttle

lever; and

a third set of cables extending from the proximal end of said slide coupler to the steering helm assembly.

31. The low speed steering system of claim 30, wherein said slide coupler and said cable support control the carburetor biasing means upon rotational movement of said steering helm assembly and positioning of said throttle lever.

32. The low speed steering system of claim 31, wherein upon setting said throttle lever in an off position and rotating said steering helm assembly causing an engine speed from about 0 to about 3,000 revolutions per minute.

33. The low speed steering system of claim 31, wherein said watercraft vehicle comprising a jet propulsion unit.

34. The low speed steering system of claim 31, wherein upon setting said throttle lever in an off position and rotating said steering helm assembly causing a thrust from about 0 to about 50 pounds to exit from an exit nozzle and venturi of said jet propulsion unit.

35. A low speed steering apparatus for a watercraft vehicle, comprising:

a steering helm assembly;

a carburetor biasing means for controlling air-fuel mixture flowing into said

carburetor;

an electronic sensor for detecting position of said steering helm assembly; and

a means for activating said carburetor biasing means.

36. The low speed steering apparatus of claim 35, wherein said carburetor biasing means being a solenoid switch.

37. The low speed steering apparatus of claim 36, further comprising a means for enabling said sensor to activate said solenoid switch.

38. The low speed steering apparatus of claim 37, wherein said sensor enabling means being an electric current traveling through an electronic wire.

Legend

Preferred Embodiments

Throttle assembly 20
- First Lever 22
- First set of cables 24
- Second lever 26
- Second set of cables 28
- Third lever 30
- Third set of cables 32

Left engine carburetor biasing means 40

Right engine carburetor biasing means 45

Left slide coupler 50
- Proximal end 52
- Distal end 54
- First cable 56

Right slide coupler 60
- Proximal end 62
- Distal end 64
- Second cable 66

Clamp 80
- Aperture 82
- Upper clip 84
- Screws 86
- Spacer 88
- Cylinders (not shown)

Cable support 100
- Support 130
- Aperture 135
  - First cable 110
    - Proximal end 112
    - Distal end 114
    - Stopper 116
  - Second cable 120
    - Proximal end 122
    - Distal end 124
    - Stopper 126
- Fist slot 102
- Second slot 104
- Center slot 106

Steering helm assembly 140

Steering wheel 142

Steering helm 143

Steering cable 144

Support cable 146

Distal end 148

Proximal end 150

Collar 152

Center steering portion 154

Underside of hull 156

Pivot connection 158

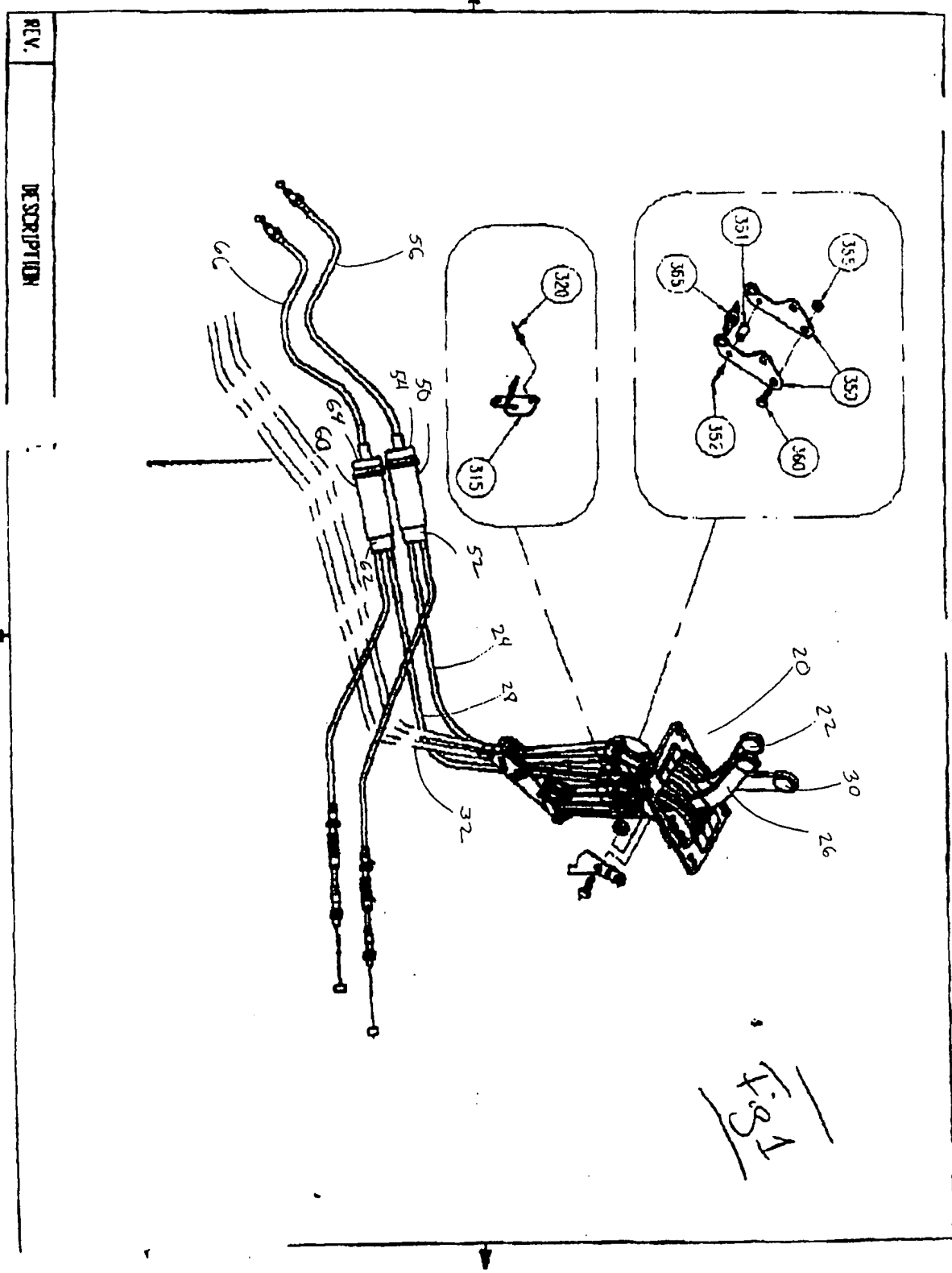

REV.
DESCRIPTION
320
315
351
355
365
352
360
56
66
54
50
64
60
62
52
24
28
20
22
30
26
32

Fig 1

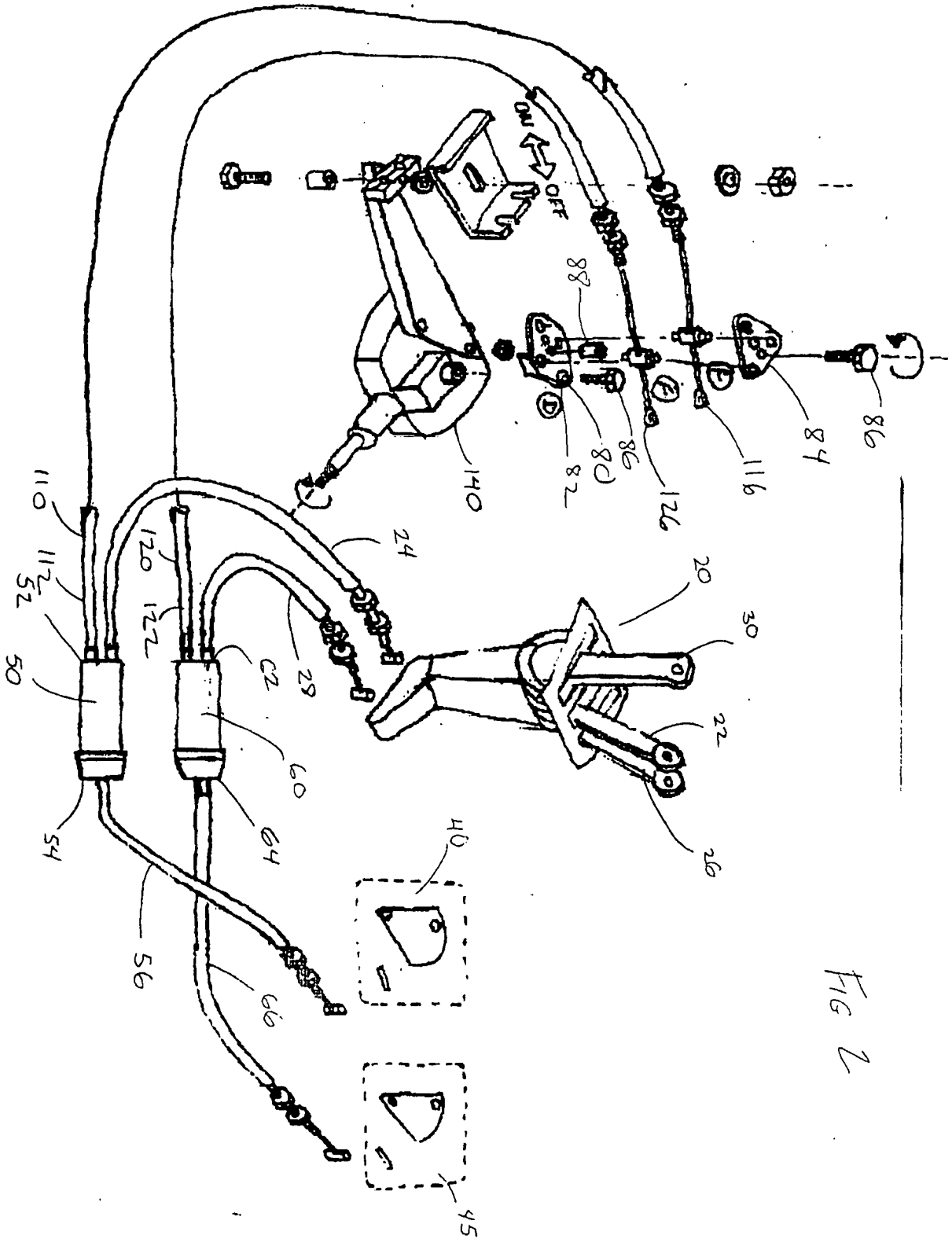

ON
OFF
88
86
82
80
84
86
116
126
140
110
112
52
120
122
24
20
30
22
26
50
28
62
60
64
54
56
66
40
45

FIG 2

ENV. PAR:

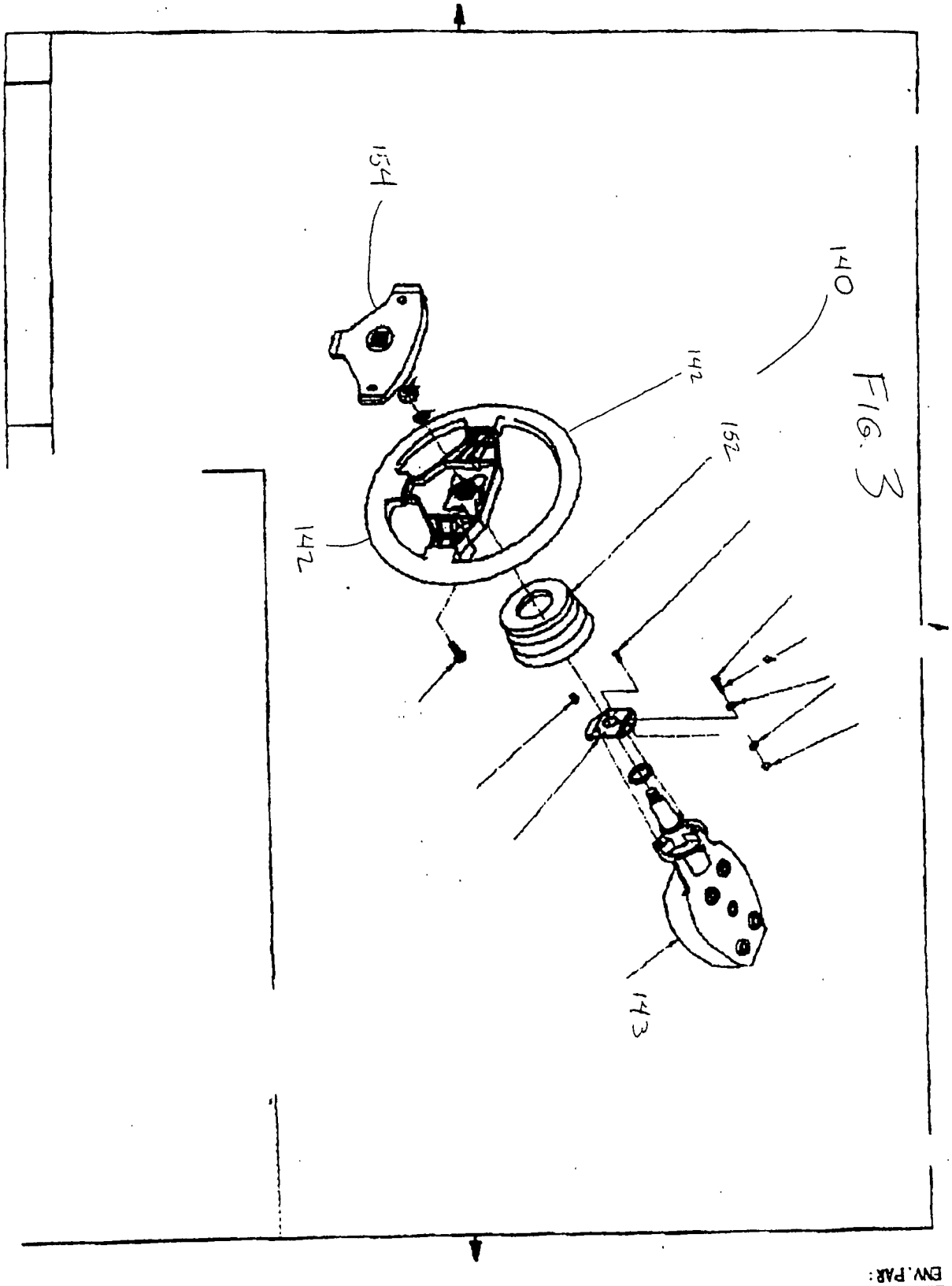


FIG. 3

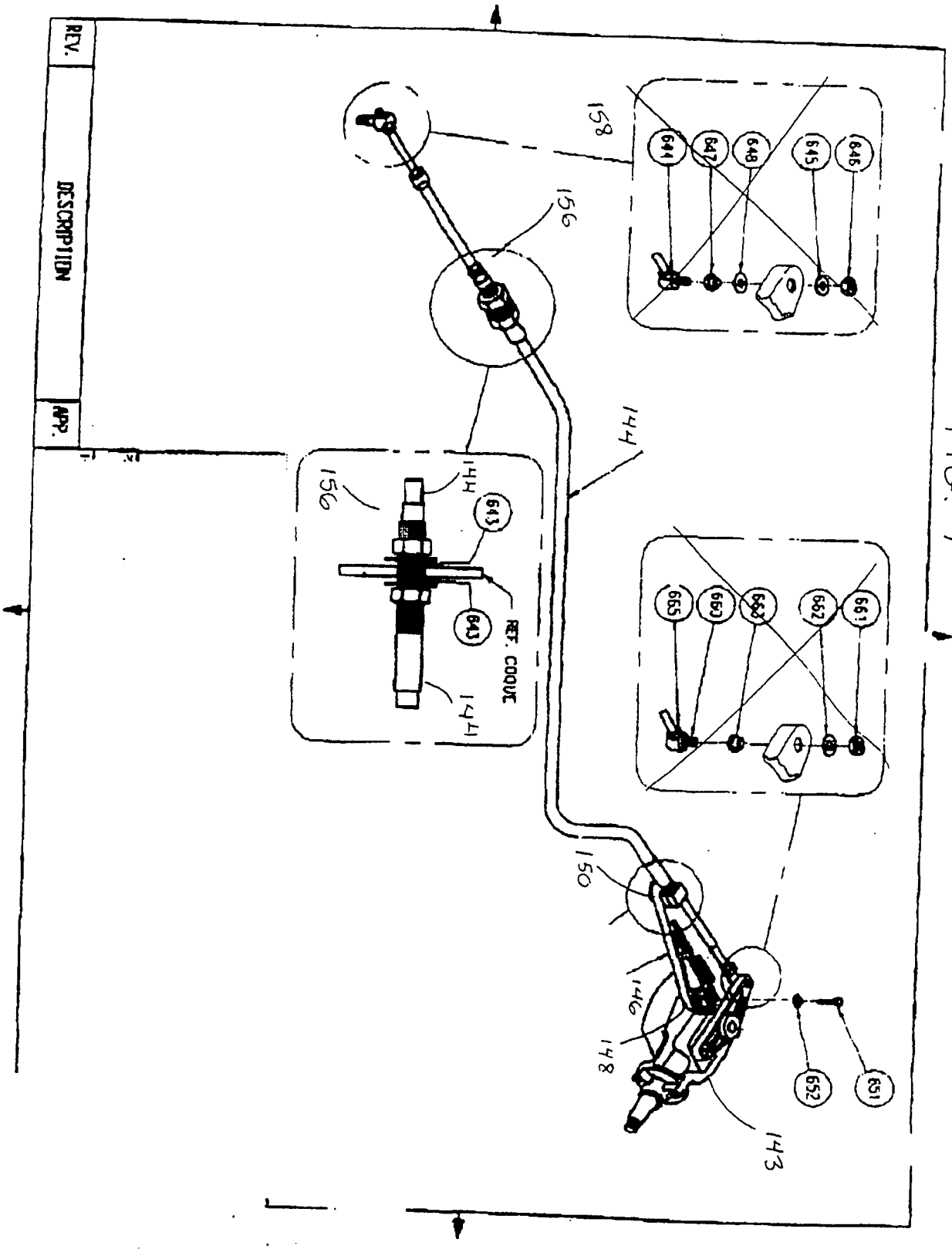

REV.
DESCRIPTION
APP.
158
156
144
641
647
649
645
646
156
144
643
643
REF. COQUE
141
665
663
662
661
150
146
148
652
651
143

FIG. 4

REV.	DESCRIPTION	APP.

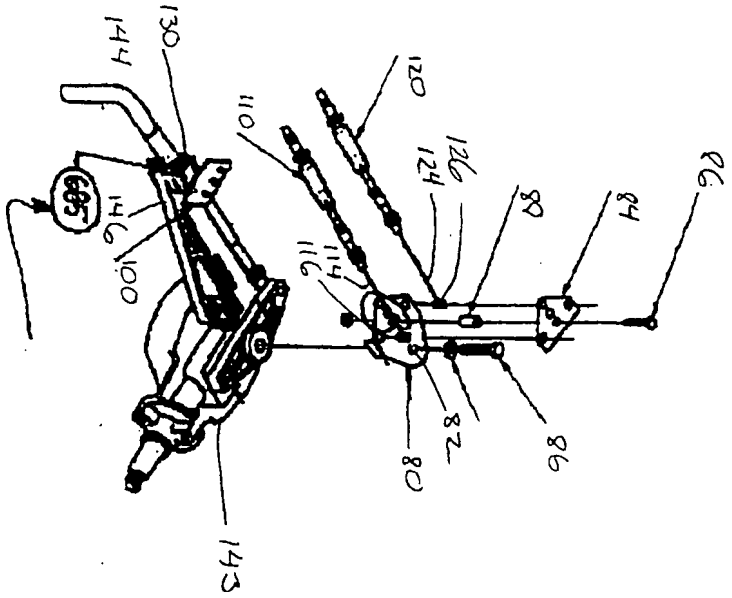


FIG. 5

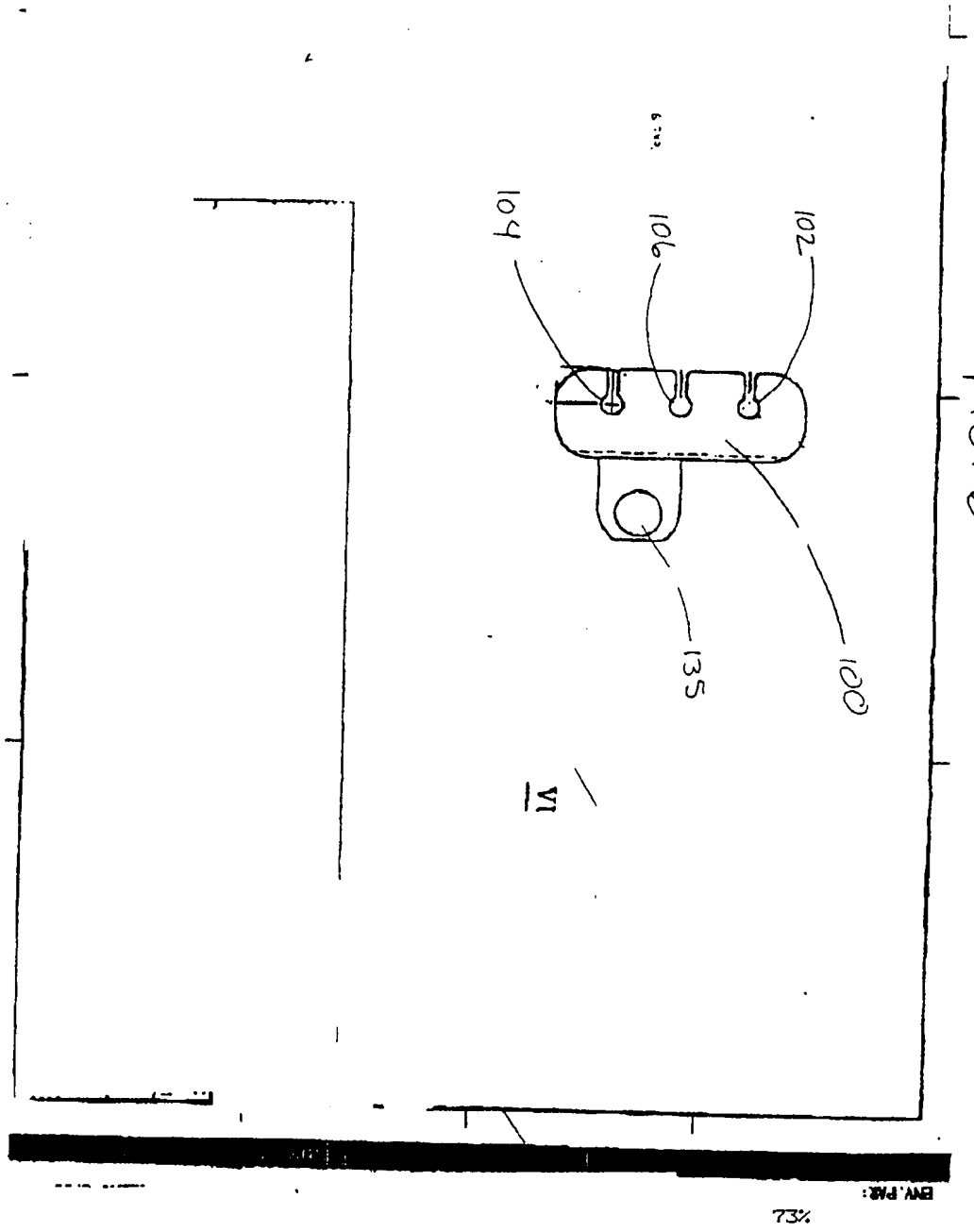


FIG. 6

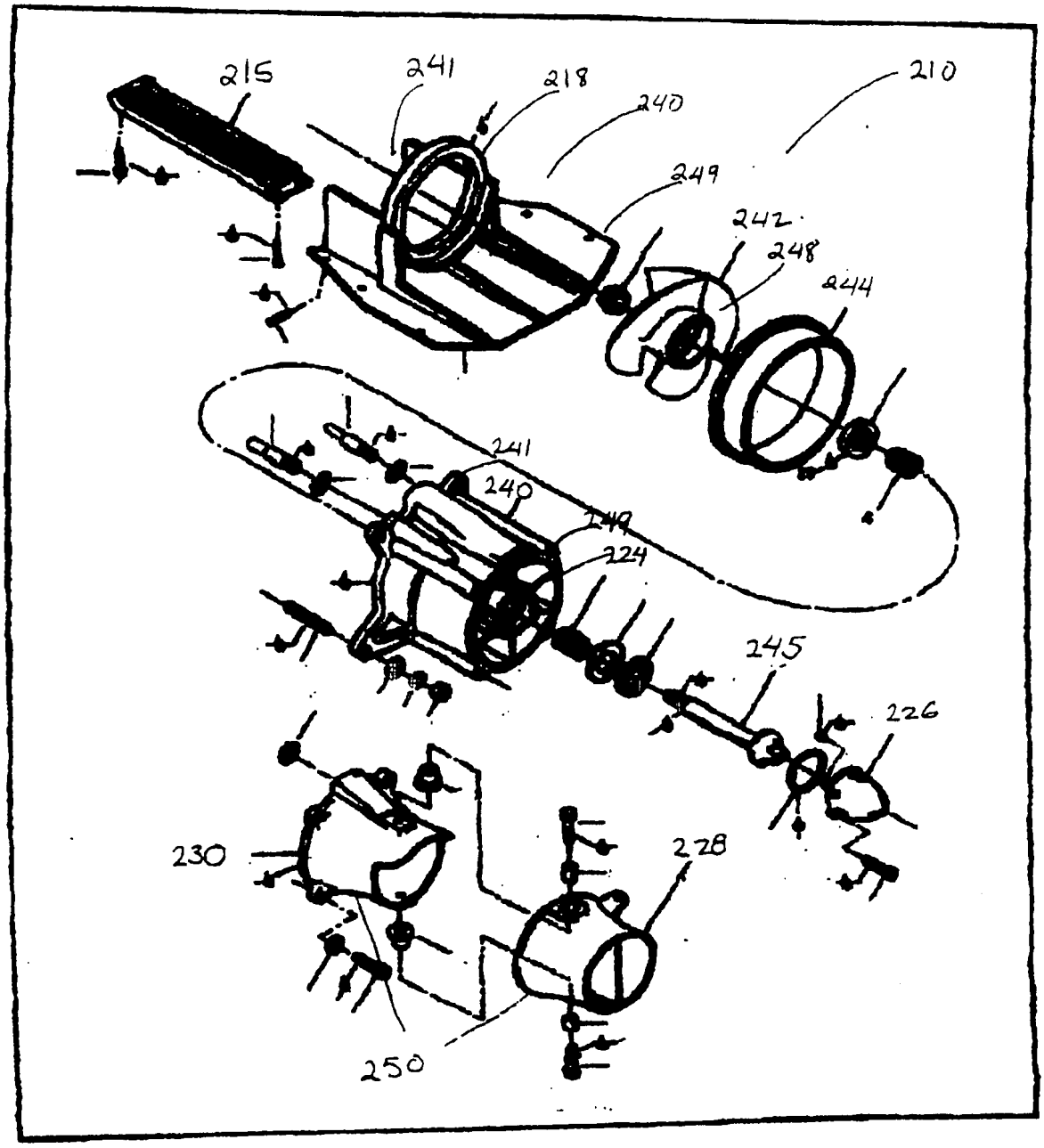

215
241
218
240
210
249
242
248
244
241
240
249
224
245
226
230
228
250

FIG. 7